Fine's Problem

$$\text{Loc} \rightarrow \text{Bell}$$

$$\text{so} \quad \sim\text{Bell} \rightarrow \sim\text{Loc}$$

But says Fine

$$\text{Bell} \rightarrow \text{J.D.}$$

↑ joint distributions for incompatible observables

$$\text{so} \quad \text{J.D.} \wedge \text{Loc} \rightarrow \text{Bell}$$

$$\therefore \quad \sim\text{Bell} \rightarrow (\sim\text{Loc}) \vee (\sim\text{J.D.})$$

Objection (Svetlichny, Redhead, Brown and Butterfield (1988))

Fine's Theorem says:
$$\text{Bell} \rightarrow \exists P(J(P))$$

prob. space ↑ ↑ J.D.

$$\rightarrow \exists R(J(R)) \qquad \left(\text{Wald} \atop 1937\right)$$

↑ self model of P

$$\rightarrow J(y) \text{ for some self model } y$$

But SRBB exhibited a self model x for which $\sim J(x)$, although Bell is satisfied

Fine's mistake was to
argue from $\sim J(y) \to \sim Bell$
to $\sim J(x) \to \sim Bell$
i.e. to conflate y with x!

Stapp's Problem

<u>PLCD</u> : Principle of Local Counterfactual Definiteness
the result of an experiment
which <u>could</u> be performed on
on a microsystem has a
definite value which does not
depend on the setting of a
remote piece of apparatus

1) Is this true if you don't
assume determinism?
2) Can you prove determinism
in the Bell experiment?

Cartwright's Problem

Can one move from
$$\text{Prob}^z(a \mid z) \text{ to}$$
$$\text{Prob}(a \mid z \cap z)$$

and regard z as a partial cause of a?

Does this prove <u>causal</u> action in the Bell experiment?

Locality enables us to write

$$[T_1]^\phi_{X+Y} = [\sigma_x^1]^\phi_X [\sigma_y^2]^\phi_X [\sigma_y^3]^\phi$$

ete.

To obtain a contradiction and hence a proof of nonlocality choose ϕ to be a simultaneous eigen state of T_1, T_2 and T_3

This enables us to write

$$[T_1]^\phi_{T_1 T_2 T_3} = [T_1]^\phi_{X+Y}$$

ete.

which produces the contradiction

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